Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of:

RE: DELETE, DELETE, DELETE
GN Docket No. 25-133

Comments of Steven K. Stroh, Amateur Radio callsign N8GNJ

Excerpts are from https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-97

My comments and suggestions that follow are in service of modernizing US Amateur Radio regulations to be relevant to the demographics and technology of the 21st century and thus make Amateur Radio more relevant and valuable to US society and contribute even more meaningfully to development of radio technology in the US.

The Commission's Part 97 regulations for Amateur Radio have "accreted" during the 20th century as radio technology evolved from spark gap transmissions that could only transmit intelligibly for a few hundred miles, to world-spanning capabilities with modulation methods such as Single Sideband (SSB) and now to Software Defined Radio technology where highly flexible hardware has truly enabled this phrase:

"If you need a new radio, you simply write one (in software)".

The emergence of Software Defined Radio technology is a monumental paradigm shift, not dissimilar to "before microcomputers / after microcomputers" and "before Internet / after Internet". Thus much of the regulation embodied in the Part 97 regulations, developed in the 20th century, intended to proscribe the capabilities of radio systems and Amateur Radio operations, is now largely irrelevant in the 21st century where any motivated experimenter can "sit down and write a new radio".

The demographics of the 21st century that relate to Amateur Radio are that increasingly, those interested in Amateur Radio are coming from a technical background, including information technology, software development, electronic hardware experimentation, cybersecurity. Many of this demographic enjoy technical activities outside their employment, such as contributing software to open source projects, "making", and contributing to STEM activities such as assisting in experimental balloon launches as part of STEM education.

The technology of the 21st century that relates to Amateur Radio is that increasingly radio technology has significantly shifted into the realm of software development - Software Defined Radio (SDR) such as represented by GNU Radio - https://www.gnuradio.org/. With SDR technology, nearly anything that can be imagined in a radio system can be implemented in a radio technology system.

In both demographics and technology of the 21st century, Amateur Radio can play a significant role. In this new demographic relating to Amateur Radio, Amateur Radio can receive empirical training in radio technology. For example, those who are interested or pursuing a career in radio technology (the “Spectrum Workforce”) - see Amateur Radio and the Growth of the Spectrum Workforce in the US National Spectrum Strategy - https://www.zeroretries.org/i/141879563/amateur-radio-and-the-growth-of-the-spectrum-workforce-in-the-us-national-spectrum-strategy can get hands-on experience with radio technology and systems.

In technology, the ability to experiment with radio technology without access to Amateur Radio is limited to a very few portions of spectrum that does not require licensing, such as the 2.4 GHz band. While experienced gained through the use of unlicensed spectrum is relevant, it’s incomplete. For example, the HF bands have vastly different characteristics than the microwave bands such as 2.4 GHz. If a student experimenter develops and tests an innovative new radio system that works great in the 2.4 GHz band, it’s likely that such a system would not be usable in the HF bands because of differences in available bandwidth, noise, propagation characteristics, etc. Thus access to Amateur Radio spectrum would provide a much better background for experimentation and development of new radio technology and systems.

The specific request from the Commission in Docket was “what can we delete”, and thus these comments are specific to that request.

References to the (discontinued) Novice class license

In numerous places in the § 97 regulations, reference is made to:

Technician, General, Advanced, or Amateur Extra Class operator license…

Examples - § 97.203 (a) and § 97.205 (a). The intent of these sections is apparently to restrict Novice class operator licenses from certain activities or portions of Amateur Radio spectrum.

The US Amateur Radio Novice class license is an anachronism, no longer available, and perhaps no Novice class licensees even exist.

Recommendation - Delete these specific references to “Technician, General, Advanced, or Amateur Extra Class operator licenses”..

Numerous References to RTTY, Packet Radio, and other data modes

In Part 97, frequent references are made to specific emissions types, especially RTTY (Radio TeleTYpe). While RTTY is still in use in Amateur Radio, it is an antiquated mode in the era of Software Defined Radio. Software Defined Radio has rendered various modes to be obsolete. Much like a personal computer (or a mobile / pocket computer) can perform a variety of roles - email, videoconference, or notepad, Software Defined

Radio technology makes it possible for a generic Software Defined Transceiver (example - Analog Devices ADALM-PLUTO - https://www.analog.com/en/resources/evaluation-hardware-and-software/evaluation-boards-kits/adalm-pluto.html to be any kind of radio within its frequency capability from 325 MHz to 3.8 GHz - analog voice, high speed data, or even RTTY.

Thus the distinctions and restrictions of various modes are largely irrelevant in the 21st century and the era of Software Defined Radios technology and now uncountable "data modes of the moment".

Recommendation - All references to "RTTY" and other digital modes such as Packet Radio, can be simplified to the term "digital / data".

Emission Types and Designators

In § 97.3 Definitions, all of these definitions are artificial distinctions developed in the 20th century. Given the experimental and widely mixed usage of spectrum in Amateur Radio, with no need to coordinate / mandate specific technologies across the entire Amateur Radio spectrum(s), all of these distinctions are largely irrelevant. The only relevant characteristics of an Emission Type is how much bandwidth is used.

Recommendation - Remove all references to Emission Types and Emission Designators.

Replacement license grant document

§ 97.29 states:

Each grantee whose amateur station license grant document is lost, mutilated or destroyed may apply to the FCC for a replacement in accordance with § 1.913 of this chapter.

This seems irrelevant given that the Commission no longer issues paper licenses.

Recommendation - Delete § 97.29.

§ 97.113 Prohibited transmissions.

(a) (5) Communications, on a regular basis, which could reasonably be furnished alternatively through other radio services.

In this era of the mobile telephone / broadband Internet system and the Internet (via mobile telephone system) and especially the Internet's worldwide accessibility and reach, it's arguable that there's any communications within Amateur Radio which "could reasonably be furnished alternative through other radio services - which includes mobile telephone / broadband networks.

For example, Amateur Radio's role in assisting large public activities such as providing communications for a marathon race or parade could (conceivably) be "furnished" by other radio services, such as mobile telephone or GMRS units. But providing such a service with Amateur Radio provides a low-cost pool of trained volunteers, and is good practice for emergency communications within Amateur Radio. Amateur Radio has proved to be a largely self-policing radio service, and the capability to use Amateur Radio for communications that are more appropriate for other radio service has not be abused.

Recommendation - Delete § 97.113 (a) (5)

(d) No amateur station, except an auxiliary, repeater, or space station, may automatically retransmit the radio signals of other amateur station.

Since the beginning of the packet radio era in the 1980s, this regulation is completely ignored in the very wide use of *digi*peaters which receive, buffer, and retransmit a data packet on the *same* frequency. Note that digipeaters are not repeaters per the definition:

§ 97.3 Definitions.

(a) The definitions of terms used in part 97 are:

(40) Repeater. An amateur station that simultaneously retransmits the transmission of another amateur station on a different channel or channels.

Digipeaters do not simultaneously retransmit, and typically transmit on the same channel.

Such operation is widely implemented in the very popular and useful Automatic Packet Reporting System (APRS) and new (and old) mesh network systems.

Recommendation: Delete § 97.113 (d).

§ 97.119 Station identification.

(b) The call sign must be transmitted with an emission authorized for the transmitting channel in one of the following ways:

(1) By a CW emission. When keyed by an automatic device used only for identification, the speed must not exceed 20 words per minute;

(2) By a phone emission in the English language. Use of a phonetic alphabet as an aid for correct station identification is encouraged;

(3) By a RTTY emission using a specified digital code when all or part of the communications are transmitted by a RTTY or data emission;

(4) By an image emission conforming to the applicable transmission standards, either color or monochrome, of § 73.682(a) of the FCC Rules when all or part of the communications are transmitted in the same image emission

These technical distinctions are increasingly meaningless in the era of new data communications methods. For example, in most data communications transmissions, the operator's callsign is embedded in the "header" of the transmission, with every data packet transmitted.

The requirement in § 97.119 (a) to identify transmissions at least every 10 minutes is sufficiently clear:

(a) Each amateur station, except a space station or telecommand station, must transmit its assigned call sign on its transmitting channel at the end of each communication, and at least every 10 minutes during a communication, for the purpose of clearly making the source of the transmissions from the station known to those receiving the transmissions. No station may transmit unidentified communications or signals, or transmit as the station call sign, any call sign not authorized to the station.

Recommendation: Delete § 97.119 (b) (1), (2), (3), and (4).

§ 97.205 Repeater station.

(c) Where the transmissions of a repeater cause harmful interference to another repeater, the two station licensees are equally and fully responsible for resolving the interference unless the operation of one station is recommended by a frequency coordinator and the operation of the other station is not. In that case, the licensee of the non-coordinated repeater has primary responsibility to resolve the interference.

From long experience as an Amateur Radio Operator, and periodic involvement with repeater construction, operation, and coordination, I attest that his section has resulted in the unintended consequence of repeaters (and repeater operators) effectively "owning" a repeater pair in a geographic area. A "coordinated" repeater operator can claim interference from any other repeater operating on the same frequencies, regardless of how much care and effective coordination is done by "non coordinated" repeaters. The claim of interference can be anything that the "coordinated" repeater owner states.

Note that in relation to § 97.205 (c):

§ 97.101 General standards.

(b) Each station licensee and each control operator must cooperate in selecting transmitting channels and in making the most effective use of the amateur service frequencies. **No frequency will be assigned for the exclusive use of any station.**

Thus it is clearly not the intent of the Commission that a particular repeater, or group, can effectively “own” a particular frequency (pair) in a geographic area.

Amateur Radio is considered to be a self-policing radio service, with Amateur Radio Operators able to work together to manage issues that arise. In the era of easy effective communications via Internet, such issues can be effectively communicated, coordinated, and managed. is clause should be sufficient “motivation” to avoid significant interference between repeaters.

§ 97.101 (d):

No amateur operator shall willfully or maliciously interfere with or cause interference to any radio communication or signal.

§ 97.101 (d) should be sufficient “motivation” to avoid significant interference between repeaters.

The issue of effective ownership of a repeater frequency (pair) by a repeater or group, effectively in perpetuity, has proven to be a significant issue in innovation within Amateur Radio. Existing repeaters, no matter how archaic their technology, no matter how little they are used, can effectively “veto” the construction of additional repeaters and new groups that want to innovate in Amateur Radio by constructing new repeaters that using new technology such as open source digital voice and data.

Thus there should be no priority assigned to any specific station, including repeaters.

Reference:

§ 97.3 Definitions

(a) The definitions of terms used in part 97 are:

(22) Frequency coordinator. An entity, recognized in a local or regional area by amateur operators whose stations are eligible to be auxiliary or repeater stations, that recommends transmit/receive channels and associated operating and technical parameters for such stations in order to avoid or minimize potential interference.

Deleting § 97.3 (a) (22) and § 97.205 (c) will remove the privileged position of earlier “coordinated” repeaters and the de facto “veto” power existing “coordinated” repeater owners. This would allow new repeaters to be constructed “talking it out” amongst existing and new repeaters per Good Amateur Practice.

Recommendation: Delete § 97.3 (a) (22)

Recommendation: Delete § 97.205 (c)

§ 97.221 Automatically controlled digital station.

None of this section makes any sense to me. Why is there such a specific set of exceptions specified? This may have made sense in the 20th century (when Morse Code / CW was used, but this seems to be an anachronism in the 21st century.

Recommendation: Delete § 97.221 (a), (b), and (c).

§ 97.303 Frequency sharing requirements.

(l) In the 219-220 MHz segment:

The Automated Maritime Telecommunications System (AMTS) was never fully realized, and the licensees have leased their allocations to other services. Thus the requirements for coordinating with AMTS stations are largely irrelevant.

I concur with the comments of Open Research Institute (ORI) in their proposed clarification / simplification of Amateur Radio operations in 219-220 MHz posted at:

https://www.fcc.gov/ecfs/search/search-filings/filing/10329271641887

Beyond the recommendations of ORI, because this band is restricted to point to point operation, such operation provides effective frequency isolation. To provide maximum usability for this band, to provide truly high speed point to point operation, the restriction of maximum 100 kHz bandwidth specified in § 97.307 (f) (13):

data emission using an unspecified digital code under the limitations listed in § 97.309(b) also may be transmitted. The authorized bandwidth is 100 kHz.

should be deleted. That is, each point to point link should be allowed to utilize the entire 1 MHz of this band. Again, because each use of this band will be between two end points, this will not result in any less usability of this band, and will provide incentive (in addition to the recommendations of ORI) to construct such links.

Recommendation - Delete § 97.307 (f) (13).

§ 97.305 Authorized emission types.

The distinctions per the Commission's rules in this section are, with the radio technology of the 21st century, largely meaningless with the blurring of the distinctions of these modes that are possible with Software Defined Radio and other technologies. One example is that some Amateur Radio HF bands are becoming increasingly unusable for (analog) "phone" operations in urban areas because of the rising radio noise in these bands from unintentional radiators such as solar panel distributed inverters on the back of each solar panel, small "wall wart" switching power supplies, and other small electronic devices. These devices are so widely distributed that this new "noise floor" is now, effectively, part of the radio environment.

I mention this example because “phone” can now encompass digital voice modulation systems such as FreeDV - https://freedv.org which provides a robust and increasingly capable voice modulation system specifically developed for use on the unique radio environment of the High Frequency bands (those below 30 MHz). Yet per the Commission’s definitions in 97.305, it’s debatable (and widely debated) whether FreeDV (and other digital voice modes) are allowable in band segments designated for “phone”.

This issue is increasingly “muddied” by the capability of FreeDV (and other digital voice systems) to carry non-voice data, such as FreeDATA - https://freedata.app which uses the same modulation as FreeDV.

Another example is Spread Spectrum (SS) technology which currently is significantly restricted in Amateur Radio. There are many different types of Spread Spectrum technology and Amateur Radio has only recently begun using Spread Spectrum technology widely with the use of LoRa - https://en.wikipedia.org/wiki/LoRa which is a proprietary implementation (by US based Semtech Corporation) of Chirp Spread Spectrum - https://en.wikipedia.org/wiki/Chirp_spread_spectrum.

As another example of experimentation that US Amateur Radio could be doing is the use of Frequency Hopping Spread Spectrum (FHSS) in its VHF and UHF bands. Historically FHSS was only usable in “wide” bands where FHSS signals can “spread out”. For example, FHSS is widely used in the 902-928 MHz band (26 MHz) and very widely (Bluetooth technology) in the 2.4 GHz band (~83 MHz). Unlike unlicensed operation for consumer use, Amateur Radio can take advantage of multiple bands, and “frequency hopping” could extend to “band hopping” where one brief SS transmission could occur on one band (such as 144-148 MHz) and the next transmission could occur on another band (such as 440-450 MHz). Some limited experimentation in previous decades revealed that the brief (100 mS) FHSS transmissions are undetectable in typical Amateur Radio operation, allowing effective simultaneous operation by FHSS and traditional Amateur Radio activities.

Thus Amateur Radio, and society, would be best served by Amateur Radio and Amateur Radio Operators having maximum flexibility to experiment and develop new radio technology, systems, techniques, etc. in the Amateur Radio bands. Amateur Radio transmissions will still be governed by other sections of § 97 including no harmful interference to other services and allowing transmissions only on specified Amateur Radio bands.

Recommendation: Delete § 97.305

§ 97.307 Emission standards.

As the Commission closed WT Docket 16-239, it requested comments as to whether it should remove remaining bandwidth and symbol rate restrictions from Amateur Radio bands not addressed in Docket 16-239. My reply is available at https://www.fcc.gov/

ecfs/document/10104172166647/1. My comments there are applicable to this section. This concluded my comments:

I recommend that the FCC allow the Amateur Radio Service to fully embrace future radio technologies by removing all baud (symbol) rates and bandwidth limits within the Amateur Radio VHF / UHF bands.

The Amateur Radio Service is an ideal environment for experimentation with new radio technologies by Amateur Radio Operators, especially now that radio technology has transitioned to "Computers - With an Antenna" and Software Defined Radio. However, increasingly such new radio technologies "don't fit" with current paradigms such as fixed bandwidth limits. Although it seems a bold step to remove all bandwidth limitations in the Amateur Radio VHF / UHF bands, the Amateur Radio Service has demonstrated its ability to self-regulate and "work it out amongst ourselves".

"No Bandwidth Limits" has been proven out by most other countries with Amateur Radio services, and there are no bandwidth limits on bands above 70 centimeters. Those two examples should provide reassurance that removing bandwidth limits will not result in chaos, or excessive interference as other commenters may predict.

Amateur Radio is still early in the transition to fully digital / data modes and Software Defined Radio, including the use of Cognitive Radio Techniques and use of Artificial Intelligence in opportunistically making full use of spectrum.

Simply… we Amateur Radio Operators don't know all of what's possible in future radio technology, but we're eager to experiment and innovate, and thus we request the FCC to "step boldly into the future of the Amateur Radio Service" by removing bandwidth limits in the Amateur Radio VHF / UHF bands.

In 1984, the FCC took a similar brave, forward looking step by allowing license-exempt operation in the Industrial Scientific Medical bands (the junk bands) with FCC 15.247, which ultimately resulted in the development of Wi-Fi, Bluetooth, and countless other innovations in radio technology. Amateur Radio Operators ask for a similar brave forward looking step by removing bandwidth limits in the Amateur Radio VHF / UHF bands.

That sentence was a bit incomplete, and as corrected:

Amateur Radio Operators ask for a similar brave forward looking step by removing bandwidth limits ***and symbol rate limits*** *in the Amateur Radio VHF / UHF bands.*

The ARRL also commented in WT Docket 16-239 - https://www.fcc.gov/ecfs/document/10109180409437/1 and explained their rationale very well (which I fully concur with) and concluded:

ARRL supports removing the symbol (baud) rate and bandwidth limitations on all of the bands addressed in the FNPRM. As explained above, the existing limits encumber

Amateur experimentation with new modes and techniques without offering countervailing benefits.

Thus maximum flexibility and enabling of experimentation and innovation would be served by removing symbol rate and bandwidth limitations on the Amateur Radio (VHF / UHF / microwave) bands above 30 MHz.

Recommendation: Delete all symbol rate and bandwidth limitations in § 97 that relate to Amateur Radio bands above 30 MHz.

Conclusion

Good Amateur Practice…

In very general terms, the maximum social benefit of the Amateur Radio service, for Amateur Radio Operators to experiment and innovate in radio technology, would be realized if the Amateur Radio regulations were simplified to specify maximum bandwidth limits in the bands below 30 MHz, no bandwidth limits in the bands above 30 MHz, commonsense safety regulations relating to transmitted radio energy, maximum power levels, and a administrative details such as required deference to primary services in shared spectrum.

in the 21st century, Software Defined Radio (SDR) technology is a transformative technology much like the microprocessor became the “do anything” chip. Before SDR, radios were fixed function comprised of specific components built to perform specific functions. Now, nearly anything is possible with SDR and Amateur Radio can become a primary “proving ground” for new approaches to radio technology if the impediments to Amateur Radio experimentation and innovation outlined above are removed.

There is ample cultural imperative embodied in the phrase “Good Amateur Practice” that Amateur Radio is a culture of sharing and cooperation. Amateur Radio is considered by all to be a self-policing service requiring minimal external supervision, policing, and enforcement. There are also ample safeguards embodied in the remaining portions of § 97 such as no exclusive uses of Amateur Radio spectrum to prevent abuse if the suggested deletions above are implemented.

I thank the Commission for this rare opportunity to comment on the regulations governing Amateur Radio and the chance to suggest meaningful changes that would benefit Amateur Radio.

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